PERFORMANCE WORK STATEMENT:
RFP CI-04-10642

TESTING AND ANALYTICAL SUPPORT FOR REGULATION OF MOTOR VEHICLES, ENGINES, FUELS AND FUEL ADDITIVES

I. BACKGROUND AND GENERAL REQUIREMENTS

EPA's Office of Transportation and Air Quality (OTAQ) administers portions of Title II of the Clean Air Act, (CAA) as amended in 1977 and 1990. OTAQ responsibilities under Title II include setting emission standards for on- and off-highway mobile sources and assuring compliance with such standards; evaluating the emissions and fuel consumption characteristics of current and potential future on- and off-highway motor vehicles, motor vehicle engines, propulsion systems and components thereof; and assessing the effectiveness and cost of current or potential future motor vehicle emission control systems. Additional OTAQ responsibilities under Title II include regulating motor vehicle fuels and fuel additives; assessing the emissions characteristics of current or potential future motor vehicle fuels and fuel additives; and characterizing the environmental and health effects of currently-regulated and non-regulated motor vehicle emissions from a wide variety of motor vehicles operating on a broad range of fuels and fuel additives. OTAQ is also required to evaluate the driveability and fuel economy impact of vehicle and fuel regulations as well as their financial impact on the regulated industry and on consumers. OTAQ also has responsibilities for developing promising new technology to achieve these ends.

Emissions and/or other types of testing and related analytical support are frequently required in support of these activities, e.g., for the characterization of emissions of both regulated and currently unregulated pollutants and assessment of their health and welfare effects; for evaluation and optimization of emission control components and systems; for development and evaluation of baseline emissions levels for emission standards and efficiency procedures for motor vehicles, motor vehicle engines, propulsion systems and components thereof; for development and evaluation of emissions and other test procedures/equipment; for establishment of baseline emissions levels for standards development, and for ensuring compliance with applicable emission standards and CAA provisions. OTAQ also requires assistance in chemical and other analyses of fuels and fuel additives (F/FA); analysis/modeling of the effects of new emission standards or the effects of changes in F/FA formulations on emissions, emission control systems and on fuel production and distribution systems; development/evaluation of health and welfare effects test protocols for F/FA and their combustion and evaporative products; development and evaluation of costs, effectiveness, health, welfare and fuel economy effects, driveability and safety effects of EPA regulatory activities.

OVERVIEW OF REQUIREMENT - The objective of this procurement is to provide OTAQ with flexible testing and related analytical support. Key areas to be covered under the resulting contract include testing, monitoring and analytical support for emissions characterization, technology assessment

and test procedure/equipment development related to regulated/unregulated emissions and fuel consumption for a wide variety of highway and non-highway vehicles/engines operating on all types of conventional, reformulated and alternative fuels in both laboratory and real-world environments. These include light-duty and heavy-duty motor vehicles/engines and components thereof, as well as marine, railway, aircraft, small engine and other non-highway propulsion systems. The types of fuels and/or fuel additives which may be considered in the above requirements include any conventional and reformulated gasoline and diesel fuels, as well as blends and alternative fuels such as methanol, ethanol, compressed natural gas (CNG), liquified natural gas (LNG), liquefied petroleum gas (LPG), hydrogen and electricity (supplied from batteries or fuel cells). Electric- and non-electric hybrid vehicles using any of
these fuels are also included. Off-highway fuels are included in the above requirements (if different from highway fuels), as are oils or other lubricants. Other related testing and analytical requirements include testing to ensure compliance with current emissions standards and other applicable regulatory requirements; safety testing of emission control systems; testing to develop emission factor data for in-use vehicles; and development and/or evaluation of various short tests and test equipment for Inspection/ Maintenance Programs. Technical support to EPA design and evaluation of prototype vehicle propulsion systems and related control, data acquisition and sampling systems will also be required.

Related analytical activities also include statistical and other analysis of emissions and other data to determine air quality effects and control effectiveness of specified emission control systems vs. their estimated costs. Also included are analysis and/or modeling of emissions and other data to determine air quality and health effects and compliance with applicable provisions of the CAA; and analysis and/or modeling of production and distribution systems related to conventional, reformulated, or alternative fuels and additives for these fuels. Other related requirements include health and environmental effects assessment and safety evaluation of components/ systems for vehicles/engines operating on conventional, reformulated and alternative fuels (as required by §§ 202 and 206 of the CAA).

II. SCOPE OF WORK

The contractor shall provide all personnel, materials, services and facilities required to perform work in response to written work assignments issued by the Contracting Officer (CO) involving one or more of the task areas specified below. In most cases, individual work assignments will involve an integrated combination of these activities. Each work assignment will provide any available related background and technical information, an explanation of the expected output and a work assignment schedule. The contractor shall respond with a workplan outlining its proposed technical approach to the work assignment, a proposed schedule and a proposed budget.

In developing the required workplan, the contractor shall acquire information as necessary from other governmental entities (Federal and non-Federal), academic and other institutions, private industry, trade associations and other publicly-available sources in addition to the background provided by EPA.

The contractor shall use the best reasonably available techniques and methodologies in all

quantitative and qualitative analyses. The contractor shall submit an appropriate Quality Management Plan (OMP) in response to this RFP, and as specified in individual work assignments, shall develop appropriate Quality Assurance Project Plans (QAPPs). The contractor shall perform and report the results of the measures provided in these plans to assure the validity and reliability of quantitative data sampling, analysis and modeling techniques. Technical accuracy and creativity in problem solving and other forms of analysis are critical to the performance of this contract.

The contractor shall present the results of each work assignment in a form usable to EPA, e.g., technical reports, databases, videotapes, etc., as specified in individual work assignments (WA) and Attachment __, Reports of Work. The timeliness and quality (scope, organization, completeness and readability) of the written products are also viewed as critical to the overall acceptability of the deliverables.

Due to short legislatively- or judicially-imposed deadlines, the contractor shall be required to provide quick-response support during the course of the contract. Short-turnaround deadlines may range from one to six weeks, and background and technical information will be provided as available and needed for such tasks. The contractor shall also be required to work on multiple work assignments concurrently.

Contractor support will be required in the following areas:

TASK 1: FUEL PROCUREMENT AND PROCESSING

In performance of this task the contractor shall obtain access to various fuels and/or fuel additives specified in individual work assignments. These fuels include conventional and reformulated gasolines and diesel fuels, and alternative fuels such as; ethanol, methanol, gasoline /alcohol blends, CNG, LNG, propane and hydrogen. Additives include commercially-obtainable bulk and aftermarket fuel additives, as well as any additives that may be developed for future alternative fuels.

Also included in this task is compositional and/or other analysis of the specified fuel. Items to be analyzed and analytical procedures to be used include the following:

-Reid Vapor Pressure (ASTM D-323 and ASTM D-4814).
-Grabner Unit measurement of vapor pressure (ASTM-ES15-90).
-Boiling point distribution (ASTM D-86).
-Octane (Research/Motor methods, ASTM D-2699 and ASTM D-2700).
-Lead content (ASTM D-2547 or ASTM D-2599).
-Unwashed Gums (ASTM D-381)
-Oxygenate analysis.
-Elemental analysis (e.g., S).
-Paraffins/Olefins/Aromatic content.
-Cetane number.
-BaP and possibly other polynuclear aromatic hydrocarbons.

-Phenols.
-Bioactivity (as determined by Ames/other bioassay tests).
-Analysis of trace elements.
-Other parameters as specified in the work assignments.

The contractor may also be called upon for collection of fuel samples from retail outlets using standard methods to limit RVP loss, and/or for measurement of retail fuel pump dispensing rates or temperature parameters.

TASK 2: ENGINE/VEHICLE TESTING

In general, the type of testing support required by EPA is developmental in nature, rather than simple confirmatory testing. The contractor shall test, often on a short-turnaround basis, any feasible combination of the separate engine types, test types, vehicle/engine classes, and fuel types listed below in Table 1. (For example, testing Otto-Cycle spark ignition engines using diesel fuel as the operating fuel, or testing a marine diesel engine on a chassis dynamometer would normally not be considered feasible combinations).

Table 1

REQUIRED TESTING CAPABILITY

Engine Type	**Test Type**	**Vehicle/Engine Class**	**Fuel Type**
Compression Ignition	Chassis Dyno[1]	Light-Duty	Gasoline
Otto Cycle	Engine Dyno	Medium- and Heavy-Duty	Diesel Fuel
Other (e.g, Electric or Hybrid)	Evaporative/ Running Loss	Motorcycle	Alcohols
	Refueling Emissions	Non-Road	Alcohol Blends
	Other (e.g. In-Use emis., Driveability, Combustion Deposit, etc.)	Locomotive	Gaseous Fuels
		Marine	Other Fuel Types (e.g., hydrogen, bio-diesel)
		Lawn/Garden and other Small Non-highway	

1. Normally refers to 48" roll electric dynamometer. 2-wheel or 4-wheel drive electric hybrid capability would

be considered an enhancement.

As specified in the work assignment, the contractor shall operate the vehicle/engine combinations above according to one or more of the following test schedules or such test schedules as may be developed in the future. Specifications for most of these test schedules can be found in the Code of Federal Regulations, Title 40, Parts 85, 86, 89, 90, 91, and 92.

-Federal and California Test Procedures (FTP) for Light-Duty Vehicles (LDV), including revisions to run with air conditioner or other losses.
-Highway Fuel Economy Test (HFET) for Light-Duty Vehicles.
-Fuel economy tests for hydrogen fuel cell vehicles per SAE J2572
-Congested Freeway Driving Cycle Schedule (CFDS) for LDV.
-Federal 9 and 13-Mode Procedure for Heavy-Duty Engines.
-Federal Smoke Exhaust Test Procedure for HD Diesel Engines.
-Federal Transient Test Procedures for Heavy-Duty Engines (Gasoline and Diesel).
-Transient Test Procedure for Heavy-Duty Vehicles (Chassis dynamometer testing).
-European communities test procedures for LD and HD engines, gaseous, PM and smoke emissions measurement, e.g., European LD gaseous and evaporative test procedures, HD cycles, e.g., ESC, ELR and ETC, and others as specified in individual work assignments.
-Transient or steady-state non-road engine cycles, e.g., 8- mode non-road, including those specified in 40 CFR, Parts 90, 91 and 92; other procedures specified in individual work assignments, including ones developed under Task 5 below.
-Other test procedures, e.g., 9 or 23 mode steady state cycles, urban bus cycles, Inspection/Maintenance short tests for gasoline- and diesel-powered light- and heavy- duty vehicles (including IM240, snap/acceleration, stall-idle or lugdown tests, and loaded steady-state and acceleration dynamometer tests), etc.
-Rapid thermal aging of catalytic emission control systems.
-Speciation of emissions to identify currently regulated and unregulated pollutants in exhaust, evaporative, refueling and/or other emissions sources (e.g., lubricants).
-Evaporative Emission/Running Loss Tests, including real-time and compressed diurnal testing (SHED or point-source methods).
-Measurement of refueling losses.
-Tests for measurement of port fuel injection deposits, intake valve deposits and combustion chamber deposits.

When specified in a written work assignment, the contractor shall perform other types of tests in the performance of specific work assignments. These tests may include procedures such as extended evaporative diurnal testing within specified temperature ranges, evaporative running loss measurement (SHED) at various elevated temperatures, low temperature chassis dyno exhaust emission measurement (20°F. cold room capability) using FTP or other driving schedules, vehicle interior air sampling, vehicle tests at high acceleration rate operation, tests to determine correlation between specified emissions sampling and measurement systems, and/or tests of current or prototype vehicle, engine, or powertrain components considered by EPA to have an impact on vehicle emissions or fuel consumption, tests to

judge the state of storage device charge for battery or hybrid-device propulsion systems (superconductors, flywheels, hydraulics), and others. As specified in individual work assignments, the contractor shall perform tests during actual vehicle/engine operation or using experimental apparatus designed to simulate vehicle operation. Such testing could include systems such as simulated evaporative emission generation using a bench-mounted evaporative emission generator and simulated evaporative emission testing using bench-mounted charcoal canisters.

In addition to these emission tests, the contractor shall be capable of evaluating the drive-ability/cold startability of a given vehicle operated on given fuels under specified ambient conditions (e.g., outdoors at low temperatures).

The contractor shall have available sufficient engineering and technical capability to perform any necessary engine diagnostics as well as vehicle, engine, component or control system modifications, such as the replacement or modification of a vehicle, engine or powertrain component (e.g., emission control component, cylinder head, manifold, etc). The contractor shall have, or be able to access, the capability for monitoring and/or modification of the emission control logic contained in vehicle emission control modules.

TASK 3: Monitoring Capabilities

The contractor shall be capable of assessing air quality impacts from mobile source (highway and nonroad) emissions in ambient and indoor environments. The main focus of the monitors shall be to measure concentrations of diesel and other vehicular exhaust components in selected outdoor and indoor locations, as required by written work assignments.

Particulate matter (PM) samples shall be collected by continuous and time-averaged methods for PM10, PM2.5, and PM1.0. Continuous methods shall include, but are not limited to, Tapered Element Oscillating Microbalance (TEOM), Quartz Crystal Microbalance (QCM), and Beta Gauge for mass, as well as aetholometers for black carbon (BC), photoacoustic samplers (BC), Scanning Mobility Particle Sizer (SMPS) for particle size, and Condensation Particle Counter (CDC) for particle number. The time-averaged PM samplers shall include, but are not limited to, size-selective medium- and high-volume, Versatile Air Pollutant Samplers (VAPS), miniVOL, and dichotomous filter samplers. Analyses for speciation of the time-averaged PM
samples may be conducted for EC/OC, organic speciation (notably PAHs), acidity, ions (sulfate, nitrate), and metals (chromium, manganese, lead, etc.). The contractor shall also have the ability to collect continuous, grab samples, and passive samples for CO, CO2, O3, SO2, and NOx. To the extent feasible, calibration and maintenance schedules for the continuous PM and CO monitors shall not occur on PM time-averaged sample days

The contractor shall also have the ability to install and maintain a portable weather station to collect near real time data on wind speed, direction (1 or 2 axes), temperature, and humidity in the study area.

TASK 4: EMISSIONS SAMPLING AND ANALYSIS

In conjunction with the vehicle/engine operation of Task 2, the contractor shall provide sampling and analysis capability for regulated and unregulated pollutants as specified in individual work assignments. This sampling capability shall be provided in accordance with sound experimental procedures and shall be available on a short-turnaround basis when required. At minimum, the emissions sampling equipment required at the onset of the contract includes the equipment listed in Appendix C. Additional specific equipment items shall be provided as needed to accomplish the vehicle/engine testing requirements in this task or in Task 2, above.

Analysis of unregulated emission products shall be done according to methods including those referenced in Appendices A and B. Compounds in this category are listed in Table A-1, and include individual hydrocarbons, aldehydes, ketones, alcohols or ethers, individual PNA (including wet chemistry and liquid chromatography), individual nitrated PNA, soluble organic fractions, sulfates, organic amines, organic sulfides, phenols, certain acids (e.g., formic), carbon, hydrogen, nitrogen, sulfur, nickel carbonyl, cyanide, nitrous oxide, DMNA, ammonia, hydrogen sulfide, and carbonyl sulfide. Other properties that may be required to be determined for regulatory purposes are boiling range, smoke content, particulate size distribution, odor (CCS-DOAS) and organic fractionation.

The contractor shall have the capability for providing analysis of multiple compounds in the same sampling time period. This may require the contractor to have sufficient dedicated capacity to run a number of such analyses simultaneously.

The contractor shall provide sampling and analysis of mobile source particulate, including particulate sizing, counting, surface area measurement, particle size differentiated mass, particle size differentiated number, particle size differentiated morphology and particle size differentiated chemical characterization of the type listed under this Task. Capabilities for particulate size differentiated sampling should extend to both steady state and transient vehicle/ engine operation. The contractor's sampling and analysis capabilities shall include detailed knowledge of aerosol physics and aerosol statistics in order to assure the validity and reliability of quantitative particulate sampling, as well as hands-on experience with the particulate instrumentation listed in Appendix B.

In addition to the above requirements, the contractor must be able to undertake the development or use of analytical methods for compounds other than those specifically covered in the above references, as directed in the work assignment. Examples of such compounds are found in Table A-1, and include benzene, toluene, 1,3-butadiene, MTBE, ETBE, and any combustion products containing elements other than carbon, hydrogen, nitrogen, oxygen, and sulfur, (e.g., metals used in some fuel additives). Analysis of lubricating oils may also be required.

The contractor shall also have the capability to deploy, collect, and evaluate vehicle activity and emissions data using remote sensing techniques specified in EPA work assignments. Remote sensing implies that the owner of the vehicle sampled is not recruited for sampling and has not been informed concerning the sampling that the sampling is taking place.

For every work assignment involving analytical measurement of regulated or unregulated pollutants (or measurement of a physical property of a vehicle or fuel) the contractor shall provide a precision statement for repeatability and method detection limits (MDL), using EPA recommended practices. Reporting of a situation where the property is below the method detection limit shall be identified as either "not detected" or "< MDL".

TASK 5: DESIGN OF CUSTOM DATA ACQUISITION EQUIPMENT/SOFTWARE

The contractor shall develop and/or modify customized data acquisition systems for emissions or other data (e.g., vehicle/engine operating parameters for non-road vehicles), including necessary hardware and software development for the specific task under consideration. As directed in individual work assignments, the contractor shall program personal computers or other devices for the collection, manipulation and logging of data, or for use as controllers for vehicle engines, powertrains, or components thereof, and other equipment such as emissions samplers, dynamometers, or analytical chemistry devices (e.g., chromatographs).

TASK 6: OPERATING CYCLE DEVELOPMENT

The contractor shall perform systematic collection of laboratory and in-use operating data, such as speed, RPM, torque, fuel flow, temperatures and pressures, for various vehicle/engine categories (e.g., urban buses, electrical or hybrid propulsion system vehicles, or non-road equipment) and shall generate, process and analyze data as necessary to support EPA development of appropriate vehicle or engine operating and test cycles.

TASK 7: PROTOTYPE PROPULSION SYSTEM DESIGN SUPPORT

The contractor shall provide support to EPA for the design, development, modification, installation, calibration and evaluation of propulsion systems and associated control systems for experimental advanced propulsion system vehicles. This task shall include any storage devices, actuators and/or sensors necessary to support a given system/subsystem, including hardware and software development (e.g., data acquisition, speed controller), necessary to support such systems/sub-systems. As specified in individual work assignments, vehicle systems shall include any combination of external or internal combustion (e.g., Otto-cycle and diesel-cycle) powerplants, including battery- or fuel cell- driven electric and hybrid vehicle designs. Support areas shall include powerplants, vehicle powertrains (including transmissions) and related systems or components thereof.

TASK 8: EVALUATION OF EMISSION CONTROL COMPONENTS/SYSTEMS

The contractor shall evaluate emission control systems or components thereof, e.g., catalysts, oxygen (O_2) sensors, electronic control modules, or other components specified in individual work assignments. These components/systems may be prototype, new, or removed from in-use vehicles (e.g., as in Task 12). In general, the contractor shall verify a system or component's operating parameters and conduct diagnostic tests to determine the overall condition of the component/system

and to evaluate its effectiveness (including on-vehicle testing).

For example, in the case of catalytic converters (or unhoused catalytic material), mentioned above for use with conventional, reformulated, and/or alternative fuels, the contractor shall, as directed by written work assignments, perform analyses such as those set forth below:

(1) Catalyst light-off time and conversion efficiency as a function of catalyst temperature, air/fuel ratio and reactant concentrations, using an engine dynamometer or other bench apparatus.

(2) Visual inspection of catalysts for external or internal damage/evidence of overheating.

(3) X-ray inspection of the catalytic converter for evidence of substrate melting or blowout (monoliths only).

(4) BET surface area test for loss of surface area due to thermal deterioration.

(5) X-ray diffraction to determine the level of conversion of gamma alumina to alpha alumina.

(6) Bulk x-ray fluorescence to test for total noble metal and poisoning.

In addition, the contractor shall provide, or be able to access, facilities suitable for thermo-aging and durbility testing of catalytic converters.

For O_2 sensors, analyses such as the following shall be performed

(1) Inspection of the oxygen sensor for physical integrity.

(2) Evaluation of oxygen sensor electrical response as a function of air/fuel ratio.

TASK 9: MODELING OF PETROLEUM REFINING AND OTHER FUEL PROCESSING

The contractor shall use, evaluate, and if necessary modify (to obtain required outputs) models representing the current state of the U.S. refining industry and alternative fuels industry, to project the capability for control and cost of controlling or altering fuel parameters such as volatility and composition (e.g., aromatics, alcohol or ether levels or additive levels), as well as the economic benefits to be derived from marketing surplus byproducts resulting from such changes (e.g, sulfur, butane or benzene).

TASK 10: AIR QUALITY AND FUEL-RELATED EMISSIONS MODELING

The contractor shall use, evaluate, and if necessary assist EPA in developing/modifying various air quality or emission impact models. These models are designed to estimate ambient air concentrations, possible health/welfare effects, and/or exposure rates of pollutants emitted by motor

vehicles/engines operating on specified conventional, reformulated, or alternative fuels, or to correlate changes in fuel properties with changes in vehicle/engine exhaust or evaporative emissions of regulated or unregulated pollutants. The contractor shall use emission factor estimates developed using the EPA MOBILEx.x or other emission factor models, as specified in individual work assignments. This requirement includes photochemical oxidant or other modeling (e.g., EKMA or Urban Airshed), for determining national, regional or local air quality effects of fuel regulatory activities. For example, the contractor may be required to model the changes in inventories and reductions in particulate, nitrogen oxides, and other compounds resulting from reformulated diesel fuel programs.

The contractor shall use various exposure models to estimate the full range of personal exposure to pollutants emitted by motor vehicles/engines operated on specified fuels, under current regulatory scenarios as well as potential proposed scenarios. This requirement includes using output from the air quality modeling described above. Exposure modeling shall include assessment of annual national averages, as well as short-term exposures for small geographic regions, modifying the air quality modeling accordingly to provide the necessary input data. The contractor shall conduct risk assessment analysis, including uncertainty and variability analyses that provide information pertaining to current regulatory scenarios, as well as to potential proposed regulatory scenarios.

As specified in individual work assignments, the contractor shall evaluate such models and/or make any necessary modifications to such models to obtain the outputs required by EPA. The contractor shall also run smog chamber experiments as necessary to obtain the data needed for modeling.

The contractor shall also provide technical support to help EPA evaluate and analyze vehicle, engine, emission and activity test program data that are used as inputs for modeling and other regulatory purposes. The contractor shall provide technical support to develop, evaluate and analyze software used for quality assurance and quality control of data that loads into the Mobile Source Observation Database (MSOD). The contractor shall provide technical support to improve both procedures and programs used to evaluate and load data into MSOD. Some examples of the types of work that may be required under this tasks includes reviewing QA/QC procedures and software and making improvements to them, converting data from test programs into standard MSOD input structures and conducting a (QA/QC) review of test program data.

The contractor shall project concentrations of individual compounds in the evaporative and/or combustion emissions from a given fuel or fuel and additive mixture, using known fuel/additive compositions and properties. The contractor shall also determine the feasibility of using emissions modeling for characterizing the individual compounds in emissions in place of analysis of actual emissions.

Task 12: COST ANALYSIS OF REGULATORY STRATEGIES/EQUIPMENT

The contractor shall determine the costs, on an absolute basis or on a dollar-per-ton of emission reduction basis, for any possible regulatory strategy involving vehicle/engine emission control

regulations. The contractor shall, as directed by written work assignment, determining both costs and benefits, and perform the tasks set forth below:

(1) Emission control component production costs, including cost of materials, direct labor, indirect labor and over-head, facilities costs, storage/shipping costs and profit.

(2) Research, development and design costs.

(3) Testing costs, including design prototype, certification or health effects testing.

(4) Capital investment costs, including depreciation and opportunity costs resulting from an inability to invest in other capital goods.

(5) Costs to the consumer, including first price increase and changes in operating and maintenance costs.

(6) Gains or losses in work hours of labor due to changes in health effects.

(7) Costs of welfare effects, e.g., gains or losses in visibility or deterioration of natural/manufactured materials.

(8) Costs/benefits from control of regulated and unregulated pollutants, including those other than the primary objective of the regulatory strategy.

(9) Social welfare costs and benefits.

(10) Calculation of costs and benefits on a regional and local, as well as national, basis.

TASK 12: STATISTICAL ANALYSIS

The contractor shall conduct statistical analyses of data obtained from testing or other sources and draw appropriate statistical inferences from the data. This capability shall include familiarity with SAS and other state-of-the-art statistical programs involving processes such as calculating means, variance, standard deviation, confidence intervals, single and multivariate linear and non-linear regressions, Poisson distributions, analysis of variance and hypothesis testing. The contractor shall also design experiments containing statistically valid sample sizes or replications and other generally-accepted quality assurance techniques to ensure that the results of such experiments will be statistically significant.

The contractor shall also provide technical support to EPA in designing, implementing, conducting and analyzing sample surveys to gather data for statistical or other analysis. Some examples of the types of work that may be required might pertain to designing different types of surveys requiring

Information Collection Requests (ICRs), used for both regulatory and research programs within EPA, implementing various sampling schemes and survey plans, analysis of survey data collected using different sampling designs and techniques, and conducting pilot or other types of surveys that have been authorized under existing ICRs.

TASK 13: SAFETY ANALYSIS OF EMISSION CONTROL STRATEGIES/EQUIPMENT

The contractor shall assess the safety impacts of possible vehicle or fuel-related operating characteristics or emission control strategies. This task includes the assessment of both the risks (or hazards) and benefits (or improvements) posed by the vehicle operating or emission control strategy. The work assignment will specify whether the specified risk/hazard assessment shall be qualitative or quantitative and if the work assignment involves assessing either absolute or relative risk. The contractor shall be tasked to perform any of several generally-accepted risk/hazard analysis methodologies, as directed in written work assignment, including Failure Mode and Effects Analysis (FMEA), Worst Case Scenario Analysis (WCSA) and Fault Tree Analysis (FTA).

The contractor shall generate data for such analyses through suitable testing or gathering for statistical accident, failure or other relevant data. The contractor shall utilize available general accident and failure data, including the following data sources: National Accident Sampling System (NASS), Fatal Accident Reporting System (FARS), National Fire Incident Reporting System (NFIRS) and National Electronic Injury Surveillance System (NEISS) as well as National Highway Traffic Safety Administration (NHTSA) recall data, technical service bulletin and owner complaint files.

Examples of potential emission control strategies to be assessed include vehicle fuel and evaporative system designs, refueling emission control systems, running loss control systems, catalytic converters, diesel particulate control devices, or new or modified propulsion systems targeted toward lower emissions or increased fuel economy.

In addition to the above technical and analytical support, the contractor shall conduct testing programs to assess fire or other safety risks related to emissions-related vehicle, fuel system or fuel modifications. Normally, this involves components of the vehicle directly related to the fuel/emission control system for both conventional and alternative fuels. As required in individual work assignments, the contractor shall provide additional assessments which include a variety of crash/non-crash ignition sources and extend to all aspects of vehicle usage.

TASK 14: LITERATURE REVIEW AND ANALYSIS

In support of the other requirements in this PWS, the contractor shall conduct literature and database searches and analyses on topics related to these requirements. For example, the contractor might be required to review the emissions effects of potential new developments in emission control hardware or to conduct a literature or database search on the current usage of particular emission control components in motor vehicle engines. When directed in specific work assignment, the contractor shall acquire the relevant documents identified in the literature search, pre-screen and

summarize these documents prior to turning them over to the project officer or to the work assignment manager. The contractor shall provide recommendations as to the studies which are most pertinent to EPA needs in terms of the objectives of the work assignment.

TASK 15: MEETING SUPPORT

The contractor may be called upon to produce high-quality graphics illustrating complex technical or other information for technical and non- technical audiences, and to provide technical expertise in support of workshops, symposia, conferences, administrative and/or judicial hearings. Normally, the contractor's primary support function will be to provide information and analyses to EPA personnel who will be attending such meetings. However, contractor personnel may occasionally be required to attend such meetings to provide expert testimony or to provide timely technical input to EPA personnel regarding presentations made by others, e.g., costs or adherence to accepted testing or other scientific practices. In such instances, the status of all contractor personnel shall be made clear through badging or other means of visual identification.

TASK 16: IN-USE VEHICLE/COMPONENT RECRUITMENT

When required in a work assignment, the contractor shall obtain a statistically valid or otherwise representative sample of a segment of mobile source targets for emission sampling and analysis. A group to be sampled may be categorized on the basis of geographic, political, temporal, functional and economic criteria. The contractor shall be capable of identifying the target population, recruiting a suitable sample, and documenting the validity of the sample. The contractor may, for example, be required to obtain in-use vehicles/engines of various model years for the purpose of testing them for emissions of interest to EPA, for characterizing usage patterns, or for exchanging a specified component, e.g., the catalytic converter or electronic control module, for a new part so that the used component may be tested. This requirement could also involve purchasing used parts removed from in-use vehicles by dealers or service stations.

TASK 17: PEER REVIEW

The contractor shall also provide peer review services. Documents to be peer reviewed include those related to existing and future work regarding emissions characterization, exposure, public health risks, and potential control strategies for both regulated and unregulated emissions, including air toxic emissions. Each peer review undertaken by the contractor shall be performed by a minimum of two contractor-reviewers per criterion, document or methodology provided by EPA. The contractor shall ensure that all peer review work is performed by independent experts
in the topic subject matter who have publications or known research in the area. Reviewers selected by and working for the contractor shall be approved in writing by the EPA Project Officer prior to their beginning work. Approval submissions shall include the reviewers' names and curriculum vitae. It is the responsibility of the contractor to ensure that all peer reviews are conducted in a manner to avoid all actual, potential or apparent conflicts of interest. All actual, potential or apparent conflicts of interest shall be identified by the contractor and reported to the Contracting Officer for consultation and

resolution. The contractor shall provide the peer reviews with all supporting materials to the project officer within thirty (30) calendar days of receipt of the materials to be reviewed. Each contractor peer review deliverable shall include written general comments, specific revisions required to improve clarity and/or scientific accuracy of the document, and any new data that might contribute to the derivation of criteria. The contractor shall not peer review its own products or the products of its subcontractors or consultants.

QUALITY ASSURANCE

A copy of the contractor's Quality Management Plan (QMP) governing the conduct of the work to be done at the contractor's facility shall be included in the contractor's proposal. The QMP defines an organization's QA-related policies and procedures, criteria for and areas of application and personnel roles, responsibilities and authorities. For individual work assignments, the Quality Management Plan is then supported by project-specific QA Project Plans. A QA Project Plan (QAPP) is the blueprint by which individual projects involving environmental data are implemented and assessed and how specific quality assurance (QA) and quality control (QC) activities will be applied during a particular project. The QMP must be constructed and written so that an assessment of its effectiveness can be made, and shall include the following elements:

Management and Organization: Describe the overall policy, scope, applicability, and management responsibilities of the contractor's quality system

Quality System and Description: Describe how the contractor manages its quality system and defines the primary responsibilities for managing and implementing each component of the system.

Personnel Qualifications and Training: Describe the procedures for assuring that all contractor personnel performing the work have the necessary skills to effectively accomplish their work.

Procurement Items and Services: Describe the procedures for purchasing items and services that directly affect the quality of environmental programs.

Documents and Records: Describe the controls used for quality-related documents and records determined to be important to the mission of the organization.

Computer Hardware and Software: Describe how the organization will ensure that computer hardware and software satisfy the organization's requirements.

Quality Planning: Describe how the individual contractor data operations will be planned to ensure that data or information collected are of the needed and expected quality

Implementation of Work Processes: Describe how the work processes will be implemented to ensure that data/information collected are of the needed and expected quality for their desired use.

Assessment and Response: Describe how the organization will determine the suitability and effectiveness of the implemented quality system and the quality performance of the programs

Quality Improvement: Describe how the organization will improve the contractor's quality system.

The QMP must contain an approval page for the signatures of the contractor's management and QA manager. The approval page may be part of a title page or a separate sheet following the title page. For additional detail, the contractor is referred to the EPA-Office of Transportation and Air Quality (OTAQ) environmental data quality website, http://www.epa.gov/quality/. The websites at http://www.epa.gov/quality/exmural.html and http://www.epa.gov/quality/qatools.html detail specific contractor requirements regarding the submission of a Quality Management Plan.

DRAFT

APPENDIX A

REFERENCES FOR ANALYSIS OF UNREGULATED POLLUTANTS

(1) "Analytical Procedures for Characterizing Unregulated Emissions from Vehicles Using Middle-Distillate Fuels," EPA report 600/2-80-068. This report may be acquired from the National Technical Information Service under NTIS No. 292093.

(2) "Analytical Procedures for Characterizing Unregulated Pollutant Emissions," EPA report 600/2-79-017. This report may be acquired from the National Technical Information Service under NTIS No. PB 81-136186.

(3) "Chemical Methods for the Measurement of Unregulated Diesel Emissions," CRC Report No. 551, available from the Society of Automotive Engineers under CRC-551.

(4) "Research Protocol Method for Analysis of Detailed Hydrocarbons emission from Automobiles by Gas Chromatography," EPA report AREAL-CPCD-MEERB RPM-001, available from US EPA, Atmospheric Research and Exposure Assessment Laboratory, Chemical Processes and Characterization Division, Mobile Source Emissions Research Branch, Research Triangle Park, NC),

(5) "Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology)," ASTM report No. D-5197-91, available from the American Society for Testing and Materials.

(6) "Test Method for Determination of C1-C4 Alcohols in Gasoline by Gas Chromatography" (with appropriate modifications for application to gas phase samples), 40 CFR Part 80, Appendix F.

TABLE A-1. LIST OF IRIS COMPOUNDS

IRIS Compound Name	CAS	Included in	Included in	IUPAC Name (or alternative)
Formaldehyde	00050-00-0	Yes	Yes	formaldehyde
Benzo[a]pyrene	00050-32-8	Yes	Yes	benzo(a)pyrene
Dibenz[a,h]anthracene	00053-70-3		Yes	dibenz(a,h)anthracene
N-Nitrosodiethylamine	00055-18-5		Yes	n-nitrosodiethylamine
Benz[a]anthracene	00056-55-3	Yes	Yes	benzo(a)anthracene
N-Nitrosodimethylamine	00062-75-9	Yes		n-nitrosodimethylamine
Methanol	00067-56-1	Yes	Yes	methyl alcohol
Acetone	00067-64-1	Yes	Yes	acetone
Chloroform	00067-66-3			trichloromethane
Benzene	00071-43-2	Yes	Yes	benzene
1,1,1-Trichloroethane	00071-55-6			1,1,1-trichloroethane
Bromomethane	00074-83-9			methyl bromide
Acetaldehyde	00075-07-0	Yes	Yes	acetaldehyde
Dichloromethane	00075-09-2			dichloromethane
Methyl ethyl ketone	00078-93-3	Yes	Yes	2-butanone
1,1,2-Trichloroethane	00079-00-5		Yes	1,1,2-trichloroethane
Acenaphthene	00083-32-9		Yes	acenaphthene
Phenanthrene	00085-01-8	Yes	Yes	phenanthrene
Fluorene	00086-73-7	Yes		fluorene
Naphthalene	00091-20-3	Yes	Yes	naphthalene
1,1-Biphenyl	00092-52-4	Yes		1,1-biphenyl
1,2-Dichlorobenzene	00095-50-1		Yes	1,2-dichlorobenzene
Cumene	00098-82-8	Yes	Yes	(1-methylethyl)-benzene
Ethylbenzene	00100-41-4	Yes	Yes	ethylbenzene
Styrene	00100-42-5	Yes	Yes	styrene
Benzaldehyde	00100-52-7	Yes	Yes	benzaldehyde
1,2-Dibromoethane	00106-93-4			1,2-dibromoethane
1,3-Butadiene	00106-99-0	Yes	Yes	1,3-butadiene
Acrolein	00107-02-8	Yes	Yes	2-propenal
Methyl isobutyl ketone	00108-10-1	Yes		4-methyl-2-pentanone
Toluene	00108-88-3	Yes	Yes	toluene
Chlorobenzene	00108-90-7		Yes	chlorobenzene
Cyclohexanone	00108-94-1	Yes		cyclohexanone
Phenol	00108-95-2		Yes	phenol
n-Hexane	00110-54-3	Yes	Yes	hexane
Anthracene	00120-12-7	Yes	Yes	anthracene
Crotonaldehyde	00123-73-9	Yes	Yes	crotonaldehyde
Pyrene	00129-00-0	Yes	Yes	pyrene
n-Heptane	00142-82-5	Yes	Yes	heptane
Benzo[g,h,i]perylene	00191-24-2	Yes	Yes	benzo(ghi)perylene
Indeno[1,2,3-cd]pyrene	00193-39-5	Yes	Yes	indeno(1,2,3-cd)pyrene
Benzo[b]fluoranthene	00205-99-2			benzo(b)fluoranthene
Fluoranthene	00206-44-0	Yes	Yes	fluoranthene
Benzo[k]fluoranthene	00207-08-9			benzo(k)fluoranthene
Acenaphthylene	00208-96-8	Yes	Yes	acenaphthylene
Chrysene	00218-01-9		Yes	benzo(a)phenanthrene
2,2,4-Trimethylpentane	00540-84-1	Yes	Yes	2,2,4-trimethylpentane
N-Nitrosodi-N-propylamine	00621-64-7	Yes		n-nitrosodipropylamine
N-Nitroso-di-n-butylamine	00924-16-3		Yes	n-nitrosodibutylamine

IRIS Compound Name	CAS	Included in	Included in	IUPAC Name (or alternative)
N-Nitrosopyrrolidine	00930-55-2		Yes	n-nitrosopyrrolidine
Tricresol	01319-77-3			cresol
Xylenes	01330-20-7		Yes	o-,m-,p-xylene
Methyl tert-butyl ether	01634-04-4	Yes	Yes	2-methoxy-2-methylpropane
Dioxins/furans	01746-01-6		Yes	2,3,7,8-tetrachlorodibenzo-p-dioxin
Lead and compounds (inorganic)	07439-92-1	Yes	Yes	lead
Manganese	07439-96-5	Yes	Yes	manganese
Mercury, elemental	07439-97-6		Yes	mercury
Molybdenum	07439-98-7		Yes	molybdenum
Nickel	07440-02-0	Yes	Yes	nickel
Silver	07440-22-4	Yes	Yes	silver
Strontium	07440-24-6	Yes	Yes	strontium
Antimony	07440-36-0	Yes		antimony
Arsenic, inorganic	07440-38-2	Yes	Yes	arsenic
Barium and Compounds	07440-39-3	Yes	Yes	barium
Beryllium and Compounds	07440-41-7			beryllium
Boron (Boron and Borates only)	07440-42-8		Yes	boron
Cadmium	07440-43-9	Yes		cadmium
Chromium	07440-47-3	Yes	Yes	chromium
Copper	07440-50-8	Yes	Yes	copper
Uranium, natural	07440-61-1	Yes		uranium
Zinc and Compounds	07440-66-6	Yes	Yes	zinc
White phosphorus	07723-14-0	Yes	Yes	phosphorus
Selenium and Compounds	07782-49-2		Yes	selenium
Chlorine	07782-50-5	Yes	Yes	chlorine
Nitric oxide	10102-43-9	Yes		nitric oxide
Nitrogen dioxide	10102-44-0		Yes	nitrogen dioxide
Nitrate	14797-55-8	Yes	Yes	nitrates
Hexachlorodibenzo-p-dioxin, mixture	19408-74-3		Yes	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
Diesel engine emissions		Yes		Diesel engine emissions
Expansion of listed compounds "xylenes"	00095-47-6	Yes	Yes	o-xylene
	00106-42-3	Yes	Yes	p-xylene
	00108-38-3	Yes	Yes	m-xylene
		Yes	Yes	m- & p-xylene
	56832-73-6	Yes	Yes	benzofluoranthene

Appendix B

Minimum Equipment Requirements for Emission Characterization

Hydrocarbons and Ethers:
Gas Chromatograph and Integrator
Flame Ionization Detector(s)
Fused Silica Capillary Column
Packed Solid Adsorbent Columns (2)
Calibration Standards

Aldehydes and Ketones:
High Performance Liquid Chromatograph and Integrator
365 nm Ultraviolet Detector
5 micron Zorbax HPLC Column
Glass Impingers or DNPH-Coated Silica Cartridges
Pump and Flow Meter
Melting Point Apparatus
Calibration Standards

Alcohols:
Gas Chromatograph and Integrator
Flame Ionization Detector(s)
TCEP Micro-Packed Column
WCOT Methyl Silicone Column
Calibration Standards

Polycyclic Aromatic Hydrocarbons:
High Performance Liquid Chromatograph and Integrator
254 nm Ultraviolet Detector
Bondpak NH_2 Column
Vydac 5 micron Column
Fluorescence Detector (various excitation and emission wavelengths required)
Kuderna-Danish Evaporator with a Micro-Snyder Condenser
Calibration Standards

Nitro- Polycyclic Aromatic Hydrocarbons:
High Performance Liquid Chromatograph and Integrator
360 nm Excitation and 430 nm Emission Fluorescence Detector
Platinum/Rhodium Catalyst Coated on 5 micron Sperisorb 5AY Alumina Column
Zorbax Columns (2)
Calibration Standards

Mobile Source Particulate:
Condensation Nucleus Counter (2)
Electrical Low Pressure Impactor
Scanning Mobility Particle Sizer (2)
Cascade Impactor
Diffusion Battery

Appendix C

Minimum Equipment Requirements for Emissions Sampling

Light-Duty

(1) CVS exhaust dilution sampling system.

(2) Tedlar bag sampling system compatible with CVS dilution sampling system.

(3) Impinger sampling system compatible with CVS dilution sampling system.

(4) Cartridge sampling system compatible with CVS dilution sampling system.

(5) Exhaust sample dilution system, compatible with CVS, capable of drawing off at least three progressively more dilute exhaust samples simultaneously.

(6) 8 inch (min.) dilution tunnel compatible with CVS dilution sampling system.

(7) 20 by 20 in. particulate filter apparatus compatible with dilution tunnels above.

(8) 47 mm particulate filter apparatus compatible with dilution tunnels above.

(9) Evaporative emission SHED enclosure capable of enclosing a chassis dynamometer and associated vehicle cooling equipment and capable of maintaining an ambient temperature environment of up to 105°F.

(10) Tedlar bag sampling system compatible SHED enclosure.

(11) Impinger sampling system compatible with SHED enclosure.

(12) Cartridge sampling system compatible with SHED.

(13) CVS exhaust dilution sampling system compatible with biological inhalation chambers.

(14) Bag mini-dilution system for LEV/Tier2 NMOG/NMHC emissions.

(15) Low-emission gas analyzers for measuring LEV/Tier2 vehicle emissions.

Heavy-Duty

(1) CVS exhaust dilution sampling system.

(2) Tedlar bag sampling system compatible with CVS dilution sampling system.

(3) Impinger sampling system compatible with CVS dilution sampling system.

(4) Trap sampling system compatible with CVS dilution sampling system.

(5) Exhaust splitter system for sampling part of heavy-duty exhaust.

(6) Double dilution system for sampling heavy-duty exhaust emissions (2007 Heavy Duty Diesel Transient Procedure per 40 CFR 86, Subpart N).

(7) PM sampling system which conforms to 2007 Federal Test Procedures specified

in 40 CFR 86, Subpart N

(8) Low-emission gas analyzer system which conforms to 2007 Federal Test Procedures specified in 40 CFR 86, Subpart N

(9) Exhaust sampling system which conforms to Federal 1984 Heavy-Duty Gasoline procedure.

(10) Large diameter dilution tunnel with capability for handling whole exhaust from heavy-duty engines (gasoline and diesel).

(11) Multiple 20 inch by 20 inch particulate filter sampling systems for large sample collection.

(12) CVS exhaust dilution sampling system compatible with biological inhalation chambers.

(13) Full-flow smokemeter (opacimeter).

(14) Partial-flow smokemeter.